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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/437,006	11/09/1999	TAMMY ZHENG	PHA 51219	7398

7590 06/07/2002

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EXAMINER

BROWN, CHARLOTTE A

ART UNIT PAPER NUMBER

1765

DATE MAILED: 06/07/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/437,006

Applicant(s)
Zheng et al.

Examiner
Charlotte A. Brown

Art Unit
1765



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Jul 9, 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) ☐ Other: _____

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DETAILED ACTION

1. The applicant's response filed on July 9, 2001 has been considered. A non-final rejection was issued on March 8, 2001. Therefore, the Advisory Action issued on June 20, 2001 was improper since a final rejection was not issued.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grimbergen et al. (US 6,081,334) in view of Witek et al. (US 5,627,395).

Grimbergen discloses an endpoint detection system for etching semiconductor layers. A substrate comprises a silicon wafer. A thin silicon oxide (gate oxide) layer is formed over the substrate. A polysilicon layer, a gate electrode layer, is deposited over the gate oxide layer. A titanium nitride antireflective layer is deposited over the gate electrode layer. A photoresist layer is formed over the antireflective layer (Column 5, lines 51-67). A substrate processing method is disclosed that etches a polysilicon overlayer on a gate oxide without etching or damaging the underlayer. Suitable etchant gas include HCl, HBr, Cl₂, O₂, He and mixtures thereof. The polysilicon layer can be etched in more than one etching step with the etching gas composition being changed during each etching step in order to stop the etching process without etching

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through the oxide underlayer on the substrate. The main etch stage was stopped by an endpoint detection system immediately before the polysilicon layer was completely etched through. An overetch stage was performed to etch through the residual portion of the polysilicon layer. In the main etch stage, the polysilicon layer was plasma etched using an etchant gas comprising Cl_2 , HBr , and He-O_2 (Column 18, lines 14-40) This reads on the applicant's limitation of using a plasma etch using a first etching chemistry.

Unlike the claimed invention Grimbergen does not disclose a method in which a second plasma etch is performed that includes HBr and nitrogen.

Witek discloses a method for forming a vertically raised transistor. A substrate for semiconductor processing is provided. A dielectric layer is formed over the substrate. The dielectric layer is preferably a TEOS based oxide or a silicon dioxide layer. A conductive layer is deposited over the dielectric layer. The conductive layer is preferably a polysilicon layer. A mask layer is deposited over the conductive layer (Column 4, lines 18-65). A isotropic etch step is used to laterally recess the sidewalls of the conductive layer (Figure 2). This reads on the applicant's limitation of selectively etching the device layer to form a pillar structure. An isotropic second etch step is also used to laterally recess the sidewalls of the conductive layer. Polysilicon may be etched using an HBr/CL_2 plasma or a CF_4 /oxygen environment. The plasma environments may contain one or more of the inert carrier gases such as Ar , H_2 , He , N_2 , or a like inert carrier gas (Column 5, lines 24-33) This reads on the applicant's limitation of using a second etch chemistry.

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Witek differs from the claimed invention by failing to specify the recited processing parameters (i.e. an etching chemistry including less than ten percent of nitrogen) but it is the Examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify Witek by attempting to optimize same by conducting routine experimentation.

It is the Examiner's position that a person having ordinary skill in the art would have found it obvious to modify Grimbergen by adding nitrogen to the second etch chemistry as taught by Witek since Grimbergen uses a HBr/Cl_2 plasma in the second etching step used to etch the device layer and the addition of nitrogen, a carrier gas, to the plasma environment as taught by Witek would have been anticipated with a reasonable expectation of success.

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. (Huang et al. US 5,837,428)

5. Applicant's arguments filed July 9, 2001 have been fully considered but they are not persuasive.

In traversing the rejection based on the combination of Grimbergen and Witek, the applicants state that the Grimbergen reference fails to teach the performance of a second plasma etch that includes HBr and a small amount of nitrogen. This point is not accepted since

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Grimbergen teaches a second plasma etch chemistry that includes hydrogen bromide and chlorine (Column 18, lines 14-27). Witek discloses a second plasma etch chemistry that includes a HBr/Cl_2 plasma. The plasma environment may contain an inert carrier gas such as nitrogen (Column 5, lines 24-33). It is the Examiner's position that a person having ordinary skill in the art would have found it obvious to modify Grimbergen by adding nitrogen to the second etch chemistry as taught by Witek since Grimbergen uses a HBr/Cl_2 plasma in the second etching step used to etch the device layer and the addition of nitrogen, a carrier gas, to the plasma environment as taught by Witek would have been anticipated with a reasonable expectation of success.

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

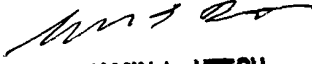
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7. Any inquiry concerning this communication from the Examiner should be directed to Charlotte A. Brown whose telephone number is (703) 305-0727. The Examiner can normally be reached during the hours of 9:00AM to 6:30PM.

The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After final communications.

CAB

June 4, 2002


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